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ABSTRACT

Indigenous peoples throughout the world have sustained their unique world views and associated knowledge systems for millennia. Many core values, beliefs, and practices associated with those world views have an adaptive integrity that is as valid today as in the past. However, traditional educational processes to transmit indigenous beliefs and practices have frequently conflicted with Western formal schooling and its world view. This paper examines the relationship between Native ways of knowing and those associated with Western science and formalized schooling in order to provide a basis for an education system that respects the philosophical and pedagogical foundations of both cultural traditions. Although examples are drawn from the Alaska Native context, they illustrate issues that emerge anywhere that efforts are underway to reconnect education to a sense of place. Elements of indigenous and Western world views are contrasted. Vignettes and examples depict the obstacles to communication between state agency personnel and local elders discussing wildlife and ecology issues; a cross-cultural immersion program for non-Native educators, held at a remote camp with Native elders as instructors; areas of common ground across world views; and indigenous implications for a pedagogy of place. Educational applications of four indigenous views are discussed: long-term perspective, interconnectedness of all things, adaptation to change, and commitment to the commons. (SV)

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Education Indigenous to Place: Western Science Meets Native Reality

by

Angayuqaq Oscar Kawagley and Ray Barnhardt

Indigenous peoples throughout the world have sustained their unique worldviews and associated knowledge systems for millenia, even while undergoing major social upheavals as a result of transformative forces beyond their control. Many of the core values, beliefs and practices associated with those worldviews have survived and are beginning to be recognized as having an adaptive integrity that is as valid for today's generation as it was for generations past. The depth of indigenous knowledge rooted in the long inhabitation of a particular place offers lessons that can benefit everyone, from educator to scientist, as we search for a more satisfying and sustainable way to live on this planet.

Students in indigenous societies around the world have, for the most part, demonstrated a distinct lack of enthusiasm for the experience of schooling in its conventional formæan aversion that is most often attributable to an alien school culture, rather than any lack of innate intelligence, ingenuity, or problem-solving skills on the part of the students. The curricula, teaching methodologies, and often the teacher training associated with schooling are based on a worldview that does not always recognize or appreciate indigenous notions of an interdependent universe and the importance of place in their societies.

Alaska Native people have their own ways of looking at and relating to the world, the universe, and to each other. Their traditional education processes were carefully constructed around observing natural processes, adapting modes of survival, obtaining sustenance from the plant and animal world, and using natural materials to make their tools and implements. All of this was made understandable through thoughtful stories and demonstration. Indigenous views of the world and approaches to education have been brought into jeopardy with the spread of western social structures and institutionalized forms of cultural transmission.

Recently, however, many Native as well as non-Native people are recognizing the limitations of the western educational system, and new approaches are being devised. It is the intent of this chapter to contribute to our understanding of the relationship between Native ways of knowing and those associated with western science and formal education, so we can devise a system of education for all people that respects the philosophical and pedagogical foundations provided by both indigenous and western cultural traditions. While the examples used here will be drawn from the Alaska Native context, they are illustrative of the issues that emerge in any context where efforts are underway to reconnect education to a sense of place (Orr, 1994).

Indigenous Knowledge Systems

While western science and education tend to emphasize compartmentalized knowledge which is often decontextualized and taught in the detached setting of a classroom or laboratory, Native people have

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traditionally acquired their knowledge through direct experience in the natural environment. For them, the particulars come to be understood in relation to the whole, and the "laws" are continually tested in the context of everyday survival. Western thought also differs from Native thought in its notion of competency. In western terms, competency is based on predetermined ideas of what a person should know, which is then measured indirectly through various forms of "objective" tests. Such an approach does not address whether that person is really capable of putting the knowledge into practice. In the traditional Native sense, competency has an unequivocal relationship to survival or extinction. You either have it, or you don't, and survival is the ultimate measure.

Native people do a form of "science" when they are involved in subsistence activities. They have studied and know a great deal about the flora and fauna, and they have their own classification systems and versions of meteorology, physics, chemistry, earth science, astronomy, psychology (knowing one's inner world), and the sacred. For a Native student imbued with an indigenous, experientially grounded, holistic perspective, typical approaches to teaching can present an impediment to learning, to the extent that they focus on compartmentalized knowledge with little regard for how academic disciplines relate to one another or to the surrounding universe.

To bring significance to learning in indigenous contexts, the explanations of natural phenomena should be cast first in Native terms to which students can relate, and then explained in western terms. For example, when describing an eddy along the river for placing a fishing net, it should be explained initially in the indigenous way of understanding, pointing out the currents, the movement of debris and sediment in the water, the likely path of the fish, the condition of the river bank, upstream conditions affecting water levels, the impact of passing boats, etc. Once the students understand the significance of the knowledge being presented, it can then be explained in western terms, such as flow, velocity, resistance, turgidity, sonar readings, tide tables, etc., to illustrate how the modern explanation adds to the traditional understanding (and vice versa). All learning should start with what the student and community know and are using in everyday life. The Native student will become more motivated to learn when the subject matter is based on something useful and suitable to the livelihood of the community and is presented in a way that reflects the interconnectedness of all things.

Since western scientific perspectives influence decisions that impact every aspect of Native peoples lives, from education to fish and wildlife management, Native people themselves have begun to take an active role in re-asserting their own traditions of science in various policy-making arenas. As a result, there is a growing awareness of the depth and breadth of knowledge that is extant in many Native societies, and its potential value in addressing issues of contemporary concern. The following observation by Bielawski (1990) illustrates this point:

> Indigenous knowledge is not static, an unchanging artifact of a former lifeway. It has been adapting to the contemporary world since contact with "others" began, and it will continue to change. Western science in the North is also beginning to change in response to contact with indigenous knowledge. Change was first seen in the acceptance that Inuit (and other Native northerners) have knowledge, that is 'know something.' Then change moved to involving Inuit in the research process as it is defined by western science. Then community-based research began, wherein communities and native organizations identified problems and sought the means to solve them. I believe the next stage will be one in which Inuit and other indigenous peoples grapple with the nature of what scientists call research (p. 18).

Such an awareness of the contemporary significance of indigenous knowledge systems is beginning to impact policy development in the North, as is evident in the following statement in the Arctic Environmental Protection Strategy (1993):

> Resolving the various concerns that indigenous peoples have about the development of scientific based information must be addressed through both policy and programs. This begins with reformulating the principles and guidelines within which research will be carried out and involves the process of consultation and the development of appropriate techniques for identifying problems that indigenous peoples wish to see resolved. But the

> most important step that must be taken is to assure that indigenous environmental and ecological knowledge becomes an information system that carries its own validity and recognition. A large effort is now underway in certain areas within the circumpolar region, as well as in other parts of the world, to establish these information systems and to set standards for their use (p. 27).

The incongruities between western institutional structures and practices and indigenous cultural forms will not be easy to reconcile. The complexities that come into play when two fundamentally different worldviews converge present a formidable challenge. In an analysis of the beliefs and practices of indigenous people from around the world, Knudtson and Suzuki (1992) identified the following characteristics as distinguishing their worldviews from the predominant beliefs and practices in western society.

Indigenous Worldviews	Western Worldview
Spirituality is imbedded in all elements of the cosmos	Spirituality is centered in a single Supreme Being
Humans have responsibility for maintaining harmonious relationship with the natural world	Humans exercise dominion over nature to use it for personal and economic gain
Need for reciprocity between human and natural worlds - resources are viewed as gifts	Natural resources are available for unilateral human exploitation
Nature is honored routinely through daily spiritual practice	Spiritual practices are intermittent and set apart from daily life
Wisdom and ethics are derived from direct experience with the natural world	Human reason transcends the natural world and can produce insights independently
Universe is made up of dynamic, ever-changing natural forces	Universe is made up of an array of static physical objects
Universe is viewed as a holistic, integrative system with a unifying life force	Universe is compartmentalized in dualistic forms and reduced to progressively smaller conceptual parts
Time is circular with natural cycles that sustain all life	Time is a linear chronology of "human progress"
Nature will always possess unfathomable mysteries	Nature is completely decipherable to the rational human mind
Human thought, feelings and words are inextricably bound to all other aspects of the universe	Human thought, feeling and words are formed apart from the surrounding world

Human role is to participate in the orderly designs of nature	Human role is to dissect, analyze and manipulate nature for own ends
Respect for elders is based on their compassion and reconciliation of outer- and inner-directed knowledge	Respect for others is based on material achievement and chronological old age
Sense of empathy and kinship with other forms of life	Sense of separateness from and superiority over other forms of life
View proper human relationship with nature as a continuous two-way, transactional dialogue	View relationship of humans to nature as a one-way, hierarchical imperative

(Adapted from Knudtson and Suzuki, 1992, p. 13-15)

The specialization, standardization, compartmentalization, and systematicity that are inherent features of western bureaucratic forms of organization are often in direct conflict with social structures and practices in indigenous societies, which tend toward collective decision-making, extended kinship structures, ascribed authority vested in elders, flexible notions of time, and traditions of informality in everyday affairs. It is little wonder then that formal education structures, which often epitomize western bureaucratic forms, have been found wanting in addressing the educational needs of traditional societies.

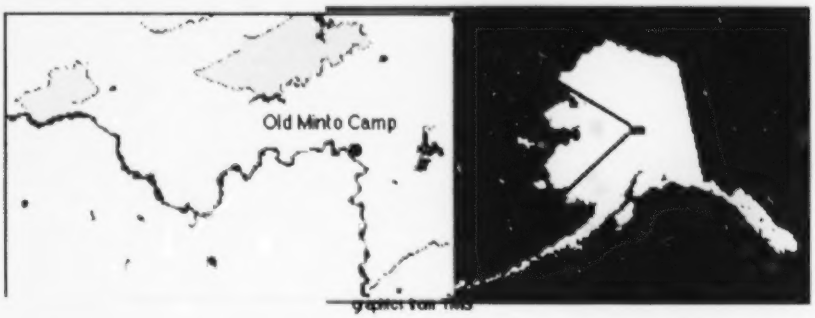
This picture is not as bleak as it once was, however, as indigenous people themselves have begun to rethink their role and seek to blend old and new practices in ways that are more likely to fit contemporary conditions. The actions currently being taken by indigenous people themselves in communities throughout the world clearly demonstrate that a significant "paradigm shift" toward the integration of indigenous knowledge systems and ways of knowing is already well underway, with the educational orientation shifting consistently toward an emphasis on the utilization of local knowledge and people in the educational process. As this shift evolves, it is not only indigenous people who will be the beneficiaries, however, since many of the issues that are being addressed are of equal significance in non-indigenous contexts (Nader, 1996). Many of the problems that originated under conditions of marginalization have gravitated from the periphery to the center of industrial societies, so the pedagogical solutions that are emerging in indigenous societies may be of equal benefit to the broader educational community. With that in mind, let us take a closer look at how these issues are played out in a particular situation.

Life in the Margins: Western Science Meets Indigenous Reality

Each summer since 1989, the University of Alaska Fairbanks has been offering a cross-cultural orientation course for educators in which we take students out to a remote abandoned village site which now serves as a cultural camp thirty miles down the Tanana River from the community of Nenana. When we first began exploring the idea for the camp, we went out to the village of Minto to meet with a group of about a dozen local elders to inquire if they would be willing to work with us to put together a program in which we would take a group of educators to the Old Minto camp to work with the elders and learn a bit about the Athabascan world and the role of education from their perspective.

By chance, when we arrived in Minto and went to the Elder's Hall, they were just beginning a meeting with a group of State Department of Fish and Game and Department of Natural Resources representatives from Fairbanks. The agency personnel had gone to Minto to explain what they were going to be doing in the way of research in the Minto Flats that summer, so that if people were out and about fishing or hunting in the Flats and ran across some of the monitoring equipment, they would know

what was happening. Old Minto (*Men-tee*) is on the south end of Minto Flats on the Tanana River, and the new village of Minto, established in 1970, is on the north end of the Flats on the Tolovana River. The people of Minto are the permanent residents of the 500 square miles of lakes, streams and forest that lie between the old and new village sites. Regardless of where the village is, Minto Flats is their home, and they know the area like they know the palm of their hand.



From the very beginning, it was obvious that the researchers regarded the meeting as a one-way event in which they were going to provide information to the people of Minto; the elders, in contrast, saw the meeting as an opportunity to provide input on issues they felt the State should be attending to on their behalf. So before they even started there was a communication problem because of the different impressions of why they were meeting, but that turned out to be the least of the problems. As they introduced themselves, each of the agency representatives noted his area of specialization. Present were a beaver specialist, two fisheries specialists (one on whitefish and one on pike), a moose specialist, and a hydrology specialist who knew something about mining sedimentation. They each had a fairly clear notion of what they wanted to convey, so they set about explaining what they were going to be doing in Minto Flats to help the people of Minto.

One of the concerns of the fisheries biologists was to find out more about the pike migration patterns in the Minto Flats area because of a serious decline in the number of pike in recent years. One of the fisheries biologists brought along a small radio transmitter that could be inserted into the pike so the signal could be used to track their movements. As he went through his explanation he passed around one of the transmitters, which was about the size of a thumb. He started to explain that these were inserted into an incision in the bottom of the pike, but he barely got the words out of his mouth and one of the elders spoke up and said: "Oh sure! We see those all the time. But you ruin the fish with them! We can't eat the fish after that!" The biologist objected: "No, we are very careful to put them in the gut sack so we don't mess with the meat of the fish. We make a small incision and put it in the gut sack.", at which the elder pointed out, "But that is the problem. The gut sack is the best part of the pike. The meat has so many bones. The gut sack is what we like, but we can't eat it anymore." It was apparent that the elder's comment didn't register with the biologist, who went on to explain how the data was transmitted to a satellite and eventually placed on a map to track the movement of the pike, all of which only added to, rather than reduced the trepidation of the people of Minto toward the work of these outside researchers.

Another issue that the hydrology specialist was concerned about had to do with the impact of mining from the area near Fairbanks that drains into the Chatanika River, which feeds into the Tolovana River, which meanders through various sloughs in the Minto Flats and eventually into the Tanana River. The Minto people had been complaining about the amount of sediment that was coming down the river and covering over the spawning beds for various species in the area. To show that the State was responding to the concern, the sedimentation specialist demonstrated a piece of equipment he had brought along which would be placed on the side of a streambed with a hose going into the water. Several times a day, it would automatically suck up a sample of water and do a sediment analysis and then enter the results on a chart. At the end of the summer, he would have a graph of the varying levels of sediment in the water. When the sedimentation specialist finished his presentation, one of the elders raised the question: "What are you going to do about the burn policy?" After a brief pause with a quizzical look from the specialist, another elder repeated: "The problem is with the burn policy!" but the quizzical look remained. Finally, one of the elders said: "The BLM policy for controlling fires. They just let fires in the

Flats burn until they get close to a man-made structure. That is what is creating a lot of the problems out here." One of the agency representatives eventually responded: "Well, there's no one from BLM here, and we can't speak for them. We don't have anything to do with their policies, so we can't deal with that issue. But, here is what happens when the sediment level builds up in the river. . ." The meeting went on with the Minto people showing considerable patience, but the frustration level on both sides was growing.

Finally, 90-year-old Peter John, an elder with very little formal schooling who has been the traditional chief of Minto for quite some time, got up and gave a fifteen minute exposition on the ecology of Minto Flats connecting all of the different elements that make up the area, including the Minto people, and how they influence one another. Eventually, he got around to pointing out that because of recent changes in BLM's burn policy, which was to let fires burn unless they endangered man-made structures, the beaver habitat in the Flats was being impacted, so the beaver were moving up river into the sloughs and building dams that were filling with sedimentation from the mining, which destroyed the pike's spawning beds. He pointed out that just because the Minto people didn't build permanent structures out in the Flats like the White man's cabins up along the rivers didn't mean that they weren't using the area.

Referring to the radio tracking of the pike, the Chief chided the biologists, "If you want to know where pike spend the winter, come and ask me. How do you think I lived to be this old? I can tell you exactly where we go to get the biggest pike and where the pike spend the winter. But I don't want to let those snowmachiners in Fairbanks know." In the course of Peter John's presentation, he pointed out that the fish and game people had referred to statistics that went back only thirty years to determine how many pike there had been in the past. "You are talking about thirty years. Our record goes back three hundred years. We know how many pike were around three hundred years ago, and how many it took to feed our families and dogs," at which point he proceeded to explain the seasonal fluctuations that were recorded in their knowledge base going back more than ten generations.

He described how, in the old days when families moved from camp to camp on the Flats they couldn't carry much food with them, so they needed to know exactly where they could expect to find the next supply. People shared this information whenever they met, and it was passed on from generation to generation as a matter of survival. The only difference was, it wasn't written down in a log book the way the scientists do, but it was just as reliable and was accumulated over a longer period of time than is available to the scientists. He pointed out that the biggest change occured about 20 years earlier when the State opened an access road to the Minto Flats for snow machines and four-wheel drive vehicles, which brought in a large influx of fishermen from Fairbanks who took more fish than the rivers and lakes could handle. The Minto people were no longer able to obtain their food from the most accessible places and were having to travel farther out into the Flats to find adequate supplies.

What Peter John and the other elders were pointing out was an enormous gap between the way the western-trained scientists and the people of Minto viewed the various elements that make up the Minto Flats area. While the scientists with their specialized knowledge and elaborate tools were well intentioned, the gulf between their compartmentalized, limited-time-frame view of the world and the holistic, multi-generational perspective of Peter John appeared insurmountable. The fish and game people couldn't see beyond their constituent parts to connect with what the elders were trying to tell them, though the Minto people had a quite sophisticated understanding of what the fish and game specialists were talking about. They had seen fish and game biologists and many other western researchers come and go hundreds of times and they knew what they did, how they did it, and why they did it. They knew all the issues and they knew many of the answers, before the specialists even began to collect their data. But the fish and game people didn't have any way to respond to the long-accumulated detailed information about Minto Flats as a complex interconnected ecosystem that Peter John had given them. Thus, one of the fundamental challenges before us is to figure out how to make connections between the view of the world that Peter John is talking about and what the fish and game people are trying to do, so that we can enter into joint ventures that are mutually respectful and recognize the validity of diverse sets of knowledge, as well as the benefits to be gained if they are pooled together in complementary ways.

The Minto elders did agree to work with us to implement a cultural immersion program for teachers, so

for the past eight summers we have been taking about thirty educators out to Old Minto to spend a week to ten days (in the middle of a three-week session) with the elders as the instructors. We make no prior stipulations about what is to go on at the campæno lectures, no seminars, none of the formal teaching we would normally do. Instead, we participate in whatever activities the elders arrange at the camp. It isn't until about half-way through the week that teachers start recognizing that we are in a different realm. Until then they process the activities through the filters they bring with them, applying what they already know from previous outdoor "camping" experiences to make sense out of the new circumstances. It's when they begin to notice the discrepancies between what they think is happening and what actually happens that they realize there is more going on than they initially recognized. It is at that point, when people start questioning their own presuppositions, that new insights begin to emerge. The elders and the other people from Minto who work with us have a remarkable capacity to open themselves up and draw people into their lives. Even teachers who are initially skeptical when they enter the program come out of it with a new set of lenses through which to view the world.

There are ways to break out of the mold in which we are oftentimes stuck, though it takes some effort. There are ways to develop linkages that connect different worldviews, at least for a few people under the right conditions. The kinds of insights that Peter John was trying to convey in the meeting with the fish and game biologists open up as many questions as answers. Each time we seek an answer to any one of the questions, more questions pop up. The exciting part of it is that more people are beginning to take these questions seriously. We have learned a tremendous amount from the experience at Old Minto, and we find each year that the more we learn the less we know, in terms of having penetrated through another layer of understanding of what life in that context is all about, only to recognize the existence of many additional layers that lie beyond our current understanding.

The tendency in most of the literature on Native education is to focus on how to get Native people to understand the western/scientific view of the world. There is very little literature that addresses how to get western scientists and educators to understand Native worldviews. We have to come at these issues on a two-way street, rather than view the problem as a one-way challenge to get Native people to buy into the western system. Native people may need to understand western science, but not at the expense of what they already know. Non-Native people, too, need to recognize the existence of multiple worldviews and knowledge systems, and find ways to understand and relate to the world in its multiple dimensions and varied perspectives.

Seeking Common Ground Across Worldviews

For Alaska Native people, culture, knowing, and living are intricately interrelated. Living in a harsh environment requires a vast array of precise empirical knowledge to survive the many risks due to conditions such as unpredictable weather and marginal food availability. To avoid starvation they must employ a variety of survival strategies, including appropriate storage of foodstuffs that they can fall back on during times of need. Their food gathering and storage must be energy efficient as well as effective. If this were not so, how could they possibly hope to survive? To help them achieve this balance, they have developed an outlook of nature as metaphysic, from which are derived the "laws" that govern all aspects of the relationships between the seen and unseen worlds.

Alaska Native worldviews and technologies are conducive to living in harmony with the universe. Their lifestyles, including subsistence methods and technologies, are exemplifications of their worldview. After all, the Creator for many Native people is the Raven, so how could the human being be superior to the creatures of Mother Earth? Harmony is the key idea behind Native subsistence practices. How could their hunting and trapping implements and practices not be respectful to animals that they would have to kill in order to live? They believe all plants, winds, mountains, rivers, lakes, and creatures of the earth possess a spirit, and therefore have consciousness and life. Everything is alive and aware, requiring that relationships be maintained in a respectful way so as not to upset the balance.

The time-honored values of respect, reciprocity, and cooperation are conducive to adaptation, survival, and harmony. Native people honor the integrity of the universe as a whole living beingæan inter-connected system. As it is living, all things of the earth must be respected because they also have life. Native people have a reciprocal relationship with all things of the universe. The importance of

maintaining the integrity of this relationship is captured by Harold Napoleon (1997) in his description of the foundation of the Yupiaq belief system.

> At the core of the spiritual belief system of the Yupiaq people was the principle that all creation was spirit: alive, conscious, and very dynamic. The foundation and the chief characteristic of this spiritual Universe was balance and harmony (*qin'nuee'jaa'raq*), with all in the Universe bound to preserving and maintaining it. In this spiritual Universe all creatures had their place, their roles to fulfill, whether it was the *I'rra'luq* (Moon), where the spirits of mammals and fish dwelt till sent to the *Nuna* (Earth) to replenish it, or the humble *ang'ya'ya'raq* (shrew), who, while physically tiny, was no inferior to man and other spirits, and had to be respected. Man was not superior to other beings but was an equal to some, inferior to others; he was thus bound by the laws of the Universe to maintaining a harmonious relationship with all spirits if he was to survive.
>
> This explains the Yupiaq preoccupation with maintaining a harmonious relationship with the spirits of the sea, the land, the rivers, the *Ellaa* (the Universe, also weather); with keeping appeased the mammal and fish on whose beneficence he depended for food, clothing, and shelter. This spiritual reality is reflected in Yupiaq art and ceremonials. It is also the foundation of Yupiaq law (*Qaa'ner'ya'raat*). The basic principle of Yupiaq law is best stated in the phrase, "*Qin'nuee'na'ne Yuuyaraq* " (To live in peace, harmony), which becomes the law, "*Qin'nuee'na'je Yuu'ge'je* " (You shall live in peace and harmony).

From observing nature, Native people learned that the earth and the universe are built upon the premise of cooperation and interdependence. Western researchers, too, must respect these values to advance knowledge and expand our consciousness. The constructs and understandings of Alaska Native people need to be honored for their integrity on the same level as the modern scientific notion of the holographic image.

The holographic image does not lend itself to reductionism or fragmentation. Reductionism seeks to break reality into parts to understand the whole, without realizing that the parts are merely patterns extant in a total web of relationships (Capra, 1996). The Native worldview does not allow separation of its parts, as each part must be understood in its relationship to the whole. Respect for the Native people who formalized this view should be practiced. Native people have transcended quantifying and sensory-constricted studies of nature practiced by the modern world. Thus, it is to everyone's benefit that there be cooperation between the researcher and Native people. The researchers need to set aside notions of human superiority to things of the universe, and people considered primitive and backward. Native people should be treated as equal human beings with heightened powers of observation, critical analysis, and a gift of intuition.

To Alaska Native people there are many things in this universe that are cyclical and describe a spiral or a circle. Examples of these include the seasons, the solar system, the timepiece of the Big Dipper going around the North Star, the Raven's path across the sky visible at certain times (as the Milky Way spiral), an eddy in the river, a whirlwind, and many other cyclical patterns reflected in nature. In each instance there is a drawing force in the center. In the Native worldview, this can be thought of as the circle of life. In each Native person's life the central drawing force is the self. The self is grounded in the profound silence of the universeæits sustenance is spiritual, it is love, it is a sense of belonging to a tribe, belonging to the universe, belonging to something greater than ones self. Despite the impact of change in Native worldviews, many of these values have remained intact and are very applicable today.

While they can be quite useful in producing insights and solutions to particular kinds of problems, mathematical and scientific disciplines and their off-spring, the engineered technologies, are often one-dimensional. These tools have the wonderful capacity for opening new discoveries in our world, but because of the western tendency to want to control nature, they can also lead to confusion and a feeling of detachment from the life force and the attendant sense of connectedness. They are bereft of the values extant in the indigenous societies, which also have the power to open doors to new discoveries. Western mathematics, sciences and technologies do reflect inherent values, some very beneficial to human well-being; however, they are too often usurped by the economic imperatives of a market-driven society

in which short-term expediency, efficiency and cost-effectiveness tend to take precedence over local considerations related to long-term sustainability, adaptability and self-sufficiency. Indigenous societies, on the other hand have continued to rely heavily on the latter qualities to survive in the contemporary world, as they did in traditional times.

From all indications, nature thrives on diversity. Look at the permutations of weather during a day, much less a month, or year. The climates differ from one part of the earth to another. The flora and the fauna exhibit great variety and differ markedly from one region to another. The continents and their geographies differ. No two snowflakes are exactly alike. The stars, constellations, and other heavenly bodies appear to be unchanging, yet our learned astronomers tell us that many changes are constantly taking place. Novae, supernovae, black holes, stars dying and being born are indicators of a continuously changing universe. The new sciences of chaos and complexity reveal patterns we never thought existed in nature. These all point to diversity, and it is the balance in all of these patterns and forces that helps nature thrive. Alaska Native people have recognized this diversity all along and have striven for harmony with all of life, even as their lives were torn asunder by forces beyond their control (Napoleon, 1991). They have now come full circle and are seeking to heal the breeches that have put their life in jeopardy. As the Yupiaq people say:*Seggangukut* '-"We are awakening, we are being energized!" They have adopted nature as their guiding force and have drawn energy from the earth.

Native people have long understood the forces of energy around us. An example of energy exchange is reflected in the story of a man out on the ocean. He gets caught on an iceberg that gets cut off from shore and drifts out. He has no choice but to try to keep warm and survive the night. The next day, he finds that the iceberg is stationary but is not attached to the shore ice. New ice has formed overnight in the water between. He remembers the advice of his elders that to test the newly formed ice and its ability to hold up a person, he must raise his ice pick about two feet above the ice and let it drop. If the weight of the ice pick allows the point to penetrate, but stops where it is attached to the wooden handle, he can try crossing on the ice. If, on the other hand, it does not stop at the point of intersection, then it will not hold up the man. In this case, the pick did not penetrate beyond the point. The man looked around him at the beauty and the might of Nature, and realizing the energies that abound, he got onto the ice. He had to maintain a steady pace for if he stopped or began to run he would fall through as a result of breaking his rhythm and concentration. The story goes that when he began his journey across the ice, there was a lightness and buoyancy in his mind. This feeling was conveyed to his physical being. Although the ice crackled and waved, he drew energy from nature by being in rhythm with the sea and ice and, maintaining a lightness and buoyancy of mind, he made it safely to the other side.

Western physics with its quantum and relativity theories suggests that matter is mostly condensed energy and that the world is made up of many interacting forces. If so, then Alaska Native people may be able to draw energy from earth because they are a part of it. All life comes from the earth. Alaska Native peoples' reliance on nature as a guiding force becomes corroborated by the western theories. This also strengthens the argument that the laboratory for teaching and learning should be embedded in the place where one lives. Young people can be energized by being outdoors in nature enjoying its beauty and becoming part of it. This can encourage self-respect and respect for others, as well as for the seen and unseen forces that dwell in and amongst all things of nature. Students in the outdoors are able to whet their observational skills while learning from nature and drawing energy for themselves. There is a vast difference in learning about the tundra in the classroom and being out in it. Being in and with the environment the whole year round, students can experience the vicissitudes of seasons, flora, fauna, sunlight, freezing, thawing, wind, weather permutations, gaining intimate knowledge about placeæusing their five senses and intuition to learn about themselves and the world around them.

It is this drawing of energy from nature that will allow the indigenous self to again become strong so that the breaks in the circle of life can be repaired. Then the individual and community can allow selected outside values and traditions which they think will strengthen their minds, bodies and spirits to filter in. The Alaska Native people will again become whole people and know what to be and what to do to make a life and a living. They will have reached into the profound silence of self to attain happiness and harmony in a world of their own making.

Indigenous Implications for a Pedagogy of Place

Indigenous societies study that which is invisible to temper the development of technology and guide its association with nature. Alaska Native worldviews deal with trying to understand the irregularities of nature which are underlain with patterns of order. Many unseen forces are in action in the elements of the universe, so it is necessary to seek out the patterns and relationships that can be recognized through detailed observations over long periods of time. Such observations and reflections embody the processes on which all education depends.

To help students begin to understand these phenomena, indigenous education should begin with the five basic elements of the universe-earth, air, fire, water and spirit (Kawagley, 1996). The sacred gifts of each must be understood, as well as the human activities which contribute to the sustainability or destruction of these life-giving gifts. In order to be holistic, the curricular activities must include indigenous language and culture, language arts, mathematics, social studies, arts and crafts, and sciences. All must be interrelated as all of earth is interrelated.

For example, in dealing with the element "air," the teacher can focus on the sacred gift of weather. And what an unpredictable choice! Like many Native myths, weather is so very dynamic, ever changing, and, like the myth, very mystical. The wind has irregularities of constantly varying velocity, humidity, temperature, and direction due to topography and other factors. There are nonlinear dimensions to clouds, irregularities of cloud formations, anomalous cloud luminosity, and different forms of precipitation at different levels. There are patterns, however tenuous, such as the path of a jet stream or fronts to be studied. The Native students' visual acuity and memory for detail can be used to advantage. The weather's dynamic is such that each part is part of a part which is a part of another part and so on. The local Native elders can explain how they are able to predict weather based upon subtle messages given to them by the wind and sun twenty-four hours earlier. This involves the language of feelings from the inner world coupled with the language of reason.

Being inclined toward the spiritual, the Native person is able to understand and accept the unpredictable permutations of weather. The Native people have learned certain general predictable patterns of weather connected to the seasons and moons. Yet, the Native student can also get acquainted with the now predominant tools of the meteorologist, such as the thermometer, barometer, anemometer, hydrometer, satellite pictures and other tools that give the elders' knowledge depth, detail, and a broader view. Introducing students to the notion of irregularities and anomalies of form and force (chaos and fractals) necessarily introduces them to holism. The key idea is for the students to understand the inter-connectedness of all things in the universe.

In using the five elements of life to teach, it is of utmost importance to assure that each element is a gift to the life-giving forces of the living earth. The teacher must be careful to explain that those gifts are absolutely necessary for life on earth to continue. Yupiaq people honor and respect these gifts in their rituals and ceremonies, incorporating all five elements in mutually reinforcing ways.

Take for example, the *Nakaciuq* , or the "Blessing of the Bladders." The Yupiaq people believed that when the seal or some other sea mammal gave itself to the hunter, the spirit of the seal entered its bladder upon giving up its life. This required that the people take care to remove the bladder, inflate it to dry, and save it for the winter Bladder Festival to honor the sacred gift of the element, "spirit." In this way the Yupiaq people honored and showed respect for the gift of the element, "earth," for giving birth to animals upon which they depended for survival as a people. During the festival, the bladders were reinflated with life-giving air and hung on poles for the duration of the activities. In the *qasgiq* (community house) were placed two three-to-four foot stout poles in front of the place of honor for the elders. On the flattened upper end of the poles were placed two earthen lamps with wicks which were then filled with seal oil. The wicks were lighted and the lamps kept burning during the entire festival. One or two people were given the responsibility of keeping the lamps going. The gift of the element, "fire," was used to light and give warmth to the community house. To purify the air and the participants in the house, wild parsnips were burned. Another gift of the element, "earth," the parsnip plant was used to create purifying smoke with the transforming gift of the element, "fire." At the conclusion of the Bladder Festival, the bladders were taken down, deflated, and carried to the ocean or river where an opening in the ice had been made. With collective mindfulness of all the Yupiaq participants that the

spirits of the animals were happy and satisfied with the care and careful execution of the required rituals and ceremonies, and that they would return and give themselves to the hunters, the bladders were returned to the sacred gift of the element, "water," the womb of creation.

To give such a curriculum real meaning for Native students, a multi-disciplinary and multi-sensory study of the elements should be undertaken for the entire school year. The students would begin to understand that the experience of knowing and making intimate acquaintance with a place takes time. The students can be helped to fine-tune their endosomatic sense-makers through carefully planned and executed lessons of observation that incorporate their language of feeling with the language of reason. The ultimate gift is that of the element, "spirit," which through the Native language, mythology, rituals, and ceremonies, introduces students to "a lifeway appropriate to place" (Mills, 1990).

Modern schools are not teaching students how to live a life that is fulfilling. Rather, the schools are giving information to students without showing them how they can transform that information into useful knowledge for making a living, not to mention preparing them to individually and collectively understand how the usable knowledge can be transformed into the wisdom needed to live a meaningful life. Instead, students now look at an innovative teacher who refuses to use existing curricula, syllabi, textbooks, lessons plans, media presentations, photocopied materials and so on, as not really "teaching." They expect to be given a lot of information and to be entertained. The many machines, modern tools, and the vaunted computers, however, are not enough to teach a lifeway that meets the inner needs of the students.

The teachers and teachers-to-be must understand that the world is nonlinear and that science will never fully understand everything about the universe. They must also realize and appreciate that in modern scientific and educational endeavors, mathematics, science and technology are interrelated with all other disciplines. It behooves us to make sure that education becomes realigned with the common philosophical thread, or the "distant memory" of the ecological perspective. All peoples of the earth began from this vista, and therefore such a perspective makes it more probable and possible for attaining a new consciousness for a sustainable life.

Indigenous Contributions to Ecological and Educational Understanding

As hinted at in the examples provided above, indigenous people have much to offer in guiding education back to a grounding in the ecology of place. Four areas in which significant benefits can be derived by reconnecting educational practice to indigenous ecological understandings may be summarized as follows:

Indigenous View	Educational Application
Long-term perspective	Education must be understood (and carried out) across generations
Inter-connectedness of all things	Knowledge is bound to the context in which it is to be used (and learned), and all elements are inter-related
Adaptation to change	Education must continuously be adapted to fit the times and place
Commitment to the commons	The whole is greater than the sum of its parts

One of the most important contributions that indigenous people are bringing to the scientific and educational arenas is a temporal dimension, that is a long-term perspective spanning many generations of observation and experimentation, which enriches the relatively short-term, time-bound observations of the itinerant western-oriented scientists and educators. The indigenous perspective adds breadth to the scientists' depth (Kawagley, 1995). As a result, patterns and cycles that are not evident in the western scientists' data base of detailed in-depth short-term observations can be factored into the equation for educational purposes. For example, a Yupiaq hunter triggered research linking industrial pollution from factories as far away as Central Europe and China to "acid snow" affecting changes in the coloration of tundra plants in Western Alaska, which he had observed over a period of 40 years. As a result, he was invited to participate in an international conference on "Arctic haze" at Cambridge University, to provide a dimension that was not readily available through conventional tools of scientific observation.

Likewise, in education we tend to look for immediate solutions to problems that are often the product of long-term generational shifts, for which the solutions, too, must be understood at a multi-generational level. The observations of a Peter John can span up to four generations, out of which patterns are recognized that are not obvious to the itinerant educator, yet it is the latter whose actions will directly impact the succeeding generations ability to participate in a rapidly changing world. For everyones benefit, it is essential that we recognize the contributions that can be derived from a multi-generational perspective.

Coupled closely with this long-term temporal dimension is another important contribution that indigenous ways of knowing providesæthat of pointing out the inter-connectedness of all the elements that make up an ecosystem, including the human element (as Peter John indicated). While western scientists tend to specialize and conduct research in one component of an ecosystem at a time, the Native observer is immersed in the system and thus is more likely to recognize how the various components relate to and depend on one another over time and across species. An Aleut observer, Larry Merculieff, made this point forcefully at an Alaska Marine Mammal Conference in 1991, which he helped organize to deal with issues associated with the sustainability of the ecosystem and economy of the Pribilof Islands. We quote his comments verbatim:

Western scientific research systems are too specialized. Bird scientists study birds. Marine mammal scientists study marine mammals. Fishery scientists study fish. They specialize even within a single category. For example, bird scientists study reproductivity by counting breeding birds on cliffs, as one

project. Another project may study just murres and kittiwakes, but not cormorants or puffins or least auklets, or fulmars or sea gulls. Another project may study cliff nesting birds at sea. Very few studies are done on how each species interacts with each other and under what environmental conditions.

Because of how different scientists are funded and because scientists do not want to step on another scientist's territory, there is little if any coordination between research on different species. Marine mammal scientists do not closely coordinate with oceanographers and climatologists. Everything is placed in specialized, separate boxes, even though we know that everything is connected. Some Soviet scientists researching the Bering Sea call American scientists "anti-ecologistic" because of American emphasis on studying single species. We will never understand the Bering Sea unless we understand the connections of all things affecting it. The Western scientific system is unable to do this.

We [Alaska Natives] see everything in terms of connections. When we hunt, we know weather, temperature, wind direction, presence of sea ice, how the ice is packed, time of day, type of season, human activityæall affect the behavior and survival of wildlife. We observe all these things all our lives.

We must act to use our knowledge to re-direct how everything we depend on is being managed by over specialized scientific systems. Scientists wonder what is happening to seals, sea lions, and birds. In the Pribilofs, we watch sea lions eating seal pups with greater frequency than ever in memory. We see chicks on bird cliffs dropping to the rocks below because they are too weak. We notice how seal pelts are thinner than ever in memory. We notice how mature bull seals are smaller than just ten years ago. This tells us that all these species are having food problems. But no scientist or manager is interested in these observations. Every coastal village where there is strong dependency on the sea for a livelihood and way of life have their own observations. We should share this information among ourselves and then act on it (p. 3-4).

Since 1991, through actions of people like Larry Merculieff, including the formation of the Indigenous People's Council for Marine Mammals, Aleut practitioners and western scientists have become collaborators in looking at the Bering Sea as an ecosystem. As a result of the input of Aleut observers, many new hypotheses have been put forward to be tested with the arsenal of specialized techniques and technology provided by western science.

In addition, Merculieff has been instrumental in the establishment of a "Stewardship Camp" for young people on the Pribilof Islands, in which future generations learn about their place in the fragile ecosystem they occupy and the responsibility they carry as the stewards of that ecosystem. The instructors for the camp include local elders as well as visiting scientists, who learn from each other while they share their knowledge with the students. Through such educational programs connected to peoples everyday lives, young people learn that every action they take, from the careers they choose to what they do with a piece of trash, is part of an inter-connected web of values and behaviors that shape who they are as a peopleæin this case the Aleut people. The surrounding environment can provide a rich laboratory for students to learn about the many interconnected forces that impact their lives and make a contribution to the well-being of their community, utilizing tools from both the indigenous and western knowledge systems.

Another important contribution that indigenous people are making to our understanding of sustainable lifestyles is the relationship between human adaptation and the dynamic nature of cultural systems. Unlike the western observers' tendency to freeze indigenous cultural systems in time, as though they existed in some kind of idealized static state destined never to change, indigenous people themselves, as a matter of cultural survival, have been quick to adapt new technologies and to grasp the "new world order." While retaining a keen sense of place and rootedness in the land they occupy, they have not hesitated to take advantage of new opportunities (as well as create a few of their own) to improve their quality of life and the efficacy of their lifestyles. This is done, however, within their own framework of values, priorities and worldview, so that the development trajectory they choose is not always the same as what outsiders might choose for them.

The recognition of cultural systems as being dynamic and ever-changing in response to new conditions has enormous implications for the sustainability of indigenous communities, especially where

demographic changes, development opportunities and technological innovations have combined to put pressure on available subsistence resources beyond the carrying capacity of the host bioregion. Nowhere has this been more complicated than in the regulation of the Bowhead whale stock available to Inupiaq hunters along the northern and northwest coasts of Alaska. For example, when Native people in northwest Alaska had to establish a priority between maximizing profits in their role as Native corporate shareholders and sustaining the subsistence whale hunt that could potentially be disrupted by ships bearing ore from their own world-class lead/zinc mine passing through the migration route of the whales, they chose to place the subsistence hunting of the whales as the top priority, and established a panel of hunters from nearby villages who had the power to shut down the mine if necessary while the communities dependent on the whales conducted their hunt. Their multinational partners in the mining venture were not necessarily in agreement with this decision, but in this case, the resource and thus the decision, was in the hands of residents of the region (Barnhardt, 1996).

Similar actions have been taken by Inupiaq people with regard to the education of their children. Not satisfied with the either/or forced-choice options often presented by the schools, whereby students are expected to select between learning to be a subsistence hunter or learning western academic knowledge, students in the village of Kaktovik have drawn on their traditional Inupiaq base-20 counting practices to create a unique numerical notation and computation system that is capable of performing high-level mathematical calculations. The system has been so successful that when they were challenged by a team of oil-field engineers with electronic calculators, the Inupiaq students were able to accurately preform the calculations faster than the engineers. They have demonstrated that it is possible to adapt to the imperatives of the western educational system without sacrificing their own cultural traditions in the process.

Another important dimension that illustrates the contribution that indigenous people can make to our thinking and practice in our relationship to the world around us is a qualitative dimension placing a priority emphasis on the sustainability of family, community and the cultural systems reflected therein. Whereas western-derived practices tend to focus on individually-oriented considerations and goals, indigenous people are more likely to seek a community-oriented approach, focusing on the commons as the basis for individual sustenance, and the individual as the basis for the strength of the commons. The educational practices associated with such an outlook are grounded in the same premises as the African proverb, "It takes a whole village to raise a child."

Along with the emphasis on sustainability of community, indigenous worldviews are more inclined to see humans as a subset of the natural world in which they are precariously situated, rather than to see nature as a repository of resources for human exploitation (Kundtson and Suzuki, 1992). Though this orientation to the natural world is often misunderstood and misrepresented in non-indigenous contexts, its spiritual and tangible connotations are very much a continuing aspect of indigenous people's livelihood, and thus underlie indigenous perspectives on the sustainability of all life. The significance of this perspective is reflected in the following preamble to a statement on Indigenous Peoples and Conservation, prepared by Indigenous Survival International in 1991:

> The Earth is the foundation of Indigenous peoples. It is the well of their spirituality, knowledge, languages and cultures. It is not a commodity to be bartered to maximize profit; nor should it be damaged by scientific experimentation. The Earth is their historian, the cradle of their ancestors' bones. It provides them with nourishment, medicine and comfort. It is the source of their independence; it is their Mother. They do not dominate Her, but harmonize with Her (p. 41).

Summary

When examining educational issues in indigenous settings, we must consider the cultural and historical context, particularly in terms of who is determining what the rules of engagement are to be, and how those rules are to be implemented. As indigenous people have begun to re-assert their "aboriginal rights" to self-determination and self-government and assume control over various aspects of their lives, one of the first tasks they have faced has been to re-orient the institutional infrastructures and practices that were established by their former overseers to make them more suitable to their needs as a people with

their own worldview, identity and history. In some instances, the initial response has been to accept the inherited structures without question and perpetuate the western systems that were put in place before, including their implicit forms of decision making, social stratification and control. In most cases, however, there have been deliberate efforts to modify the inherited institutions, or create new institutional and political structures, such that indigenous cultural forms and values are taken into account wherever possible (Barnhardt, 1991). The tide has turned and the future of indigenous education is clearly shifting toward an emphasis on providing education in the culture, rather than education about the culture. From this we will all benefit.

It is recognized that the obstacles to change are many and the challenge is enormous, but no less than the survival of indigenous people as distinct societies is at stake, and with them the essential diversity that is vital to the survival of all humankind. The elemental nature of the work before us is succinctly captured by the following observation on the current state of Native education:

> In the past, Native people tended to view formal education as a hindrance to their traditional ways, but now they are beginning to look at it in a different light. They are seeking to gain control of their education and give it direction to accomplish the goals they set for it, strengthening their own culture while simultaneously embracing western science as a second force that can help them maintain themselves with as much self-reliance and self-sufficiency as possible. They have learned to thrive in a tough environment, and they can make it easier and less harsh, first as humans, secondly as scientists, with a carefully developed technology supported by an attuned educational system (Kawagley, 1995, p. 111).

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